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COMPANY

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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

FACILITY SAFETY ANALYSIS

FOR THE

**AQUEOUS WASTE TRANSFER PROJECT
(PWTS and AWTs)**



REVIEWED FOR CLASSIFICATION/UCNI

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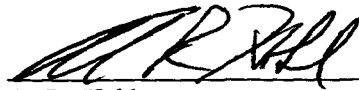
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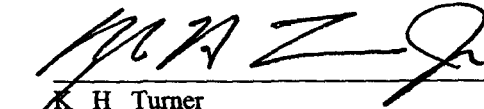


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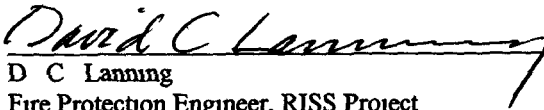
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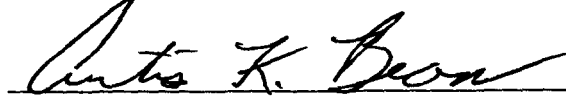
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CHANGE SUMMARY

Revision Number	Description
0	Original Issue
1	Provided technical updates to the PWTS Annual update
2	Provided technical updates to the PWTS Annual update
3	<p>Provided technical updates to the PWTS and reflected the future, interim use of some PWTS components by the AWTS in accordance with the K-H Site Wastewater Treatment Strategy</p> <ul style="list-style-type: none"> • Deleted Table 4 "Hazardous Material Inventory Controls for Process Waste" and general controls and replaced them with new Section 3, "Safety Management Programs (SMPs) and Section 5 "Scope of Approved Activities and Operational Controls" Adherence to these Sections SMPs and controls protect the facility's safety envelope and <i>radiological</i> hazard categorization • Changed the Material At Risk (MAR) for the 231 "A" and "B" Tanks segment from 0.91 grams to less than 8.4 grams Pu equivalent. Also established inventory limits of 8.4 grams Pu equivalent for the PWTS valve vaults/piping and onsite tanker trucks segments • Updated Section 2.2.6 "Facility Inventory and Source Term Development" to reflect the new AWTP's WAC MAR. • Updated Section 4.4 "Facility Hazard Classification" to include a MAR estimate and assumptions used to develop the MAR estimate
4	<p>Integrated the AWTS offsite transport tanker truck segment into the PWTS FSA. Re-titled the document to the Aqueous Waste Transfer Project (PWTS and AWTS) FSA.</p> <ul style="list-style-type: none"> • Added new Figure 1 depicting updated PWTS – AWTS interfaces • Addressed FSA interfaces with related FHA and EPA conclusions in Section 4.2.1 • Updated Table 1 "Hazard Identification Checklist" and Table 2 "System Hazard Descriptions" to reflect AWTS offsite tanker truck hazards • Updated Table 5 "System Hazards and Hazard Categories" to include the AWTS offsite transport tanker truck. Added transportation safety evaluation to Section 4 • Added transportation controls to Section 5 • Section 5 describes the AWTP's (PWTS and AWTS) WAC

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EXECUTIVE SUMMARY

This facility safety analysis (FSA) provides final hazard classification and authorization basis documentation for the Aqueous Waste Transfer Project (AWTP). The AWTP analyzed in this FSA is comprised of its two major systems: the Process Waste Transfer System (PWTS), and the Aqueous Waste Treatment System (AWTS). This AWTP FSA addresses the hazards associated with both systems and their respective segments. The document's Change Summary presents the evolution and integration of the PWTS and AWTS into this single AWTP safety analysis. This FSA meets requirements for an auditable safety analysis as referenced in Department of Energy (DOE) Environmental Management (EM) Limited Standard, DOE-EM-STD-5502-94, *Hazard Baseline Documentation*. This standard was retired by DOE Sunset Review in October 2001 and has been replaced by DOE-STD-1120-98. In accordance with the new standard, "Sites that have previously implemented DOE-EM-STD-5502-94 facility designations may continue to use them for their intended purposes" (DOE, 1998).

The PWTS and AWTS systems, together, are integral parts of the Site Wastewater Treatment Strategy designed to allow early Site closure. The PWTS provides a means to transport, via a system of underground process lines and onsite tanker trucks, process liquid low level/low level mixed (LL/LLM) waste solutions from Site process facilities to the AWTS 231 Tanks for storage. The stored waste will then be transported offsite by the AWTS subcontractor.

The AWTS will utilize elements of the PWTS for onsite transfers of LL/LLM waste solutions to the 231 "A" and "B" Tanks for storage. The 231 "A" Tank will be used only for contingency storage. The AWTS uses a subcontractor operated offsite tanker transport truck to convey this liquid LL/LLM waste to an offsite facility for treatment. AWTS operations are planned to commence in May 2002 with the filling of the 231 "B" Tank. The 231 "A" Tank is presently being emptied and cleaned and may be used by the AWTS, if required, for contingency storage.

The hazards associated with the PWTS and AWTS include those associated with radioactive and hazardous chemical constituents of the LL/LLM wastewater. The principal receptors at risk are the immediate and collocated workers. The major risk to collocated workers is exposure to an accidental release of radioactive and/or hazardous chemical waste solutions. Major risks to the immediate workers are standard industrial hazards that are addressed by DOE-prescribed occupational safety and health standards. Potential public consequences due to transportation-related accidents are identified as *low*.

Based on guidance provided in DOE-STD-5502-94, *Hazard Baseline Documentation*, the final hazard classification for the AWTP (i.e., PWTS and AWTS), including the systems' associated PWTS pumphouse (Building 231), valve vaults, transfer line segment, the PWTS onsite tanker truck segment, the AWTS 231 "A" and "B" Tanks segment, and the AWTS offsite tanker truck segment, is *radiological*. The PWTS and AWTS are distributed across the Site, and as such, are segmented as allowed by DOE-STD-1027-92, Attachment 1, General Ground Rules. The lack of physical interaction between the independent PWTS and AWTS segments, and the hazard controls described herein precludes bringing radiological

materials such as plutonium (Pu) together or causing harmful interaction from common severe phenomena

A *radiological* hazard classification requires compliance with applicable OSHA Standards, including the requirements of a site-specific Health and Safety Plan (HASP), and preparation of an auditable safety analysis. This analysis serves as the auditable safety analysis for the Aqueous Waste Transfer Project and its major PWTS and AWTS systems.

1. INTRODUCTION

The AWTP (i.e., PWTS and AWTS), is an integral part of the Site Wastewater Treatment Strategy designed to allow early Site closure, and as such, are included together for purposes of safety analysis

The PWTS provides a means to transport, via a system of underground valve vaults, lines, pumps, portable tanks, and onsite tanker trucks, process liquid low level/low level mixed (LL/LLM) (≤ 100 nanocuries per gram [nCi/g]) waste solutions from Site process facilities to the AWTS 231 Tanks for storage. The stored waste will then be transported offsite by the AWTS subcontractor for treatment. In addition to routine operation, maintenance, and surveillance activities, activities performed in the various PWTS elements are focusing on hazard reduction in support of near-term RCRA Stable/Closure activities. Future PWTS activities may include remediation, and decontamination and decommissioning (D&D) in support of Site closure.

The AWTS will utilize elements of the PWTS for onsite transfers of LL/LLM waste solutions to the 231 "A" and "B" Tanks for storage; the 231 "A" Tank will be used only for contingency storage. The AWTS uses a vendor-operated offsite tanker transport truck to convey this liquid LL/LLM waste to an offsite facility for treatment. AWTS operations are planned to commence in May 2002 with the filling of the 231 "B" Tank. The 231 "A" Tank is presently being emptied and cleaned and may be used by the AWTS, if required, for contingency storage.

This AWTP facility safety analysis (FSA) is a part of the Rocky Flats Environmental Technology Site (RFETS) *Site Safety Analysis Report* (Site SAR), Volume II (RFETS, 2001a). It addresses the final hazard classification and documents the authorization basis, including participation in Site Safety Management Programs (SMPs) for both the PWTS and AWTS facilities. The AWTP (i.e., PWTS and AWTS) is classified as a *radiological* facility in accordance with DOE-EM-STD-5502-94, *Hazard Baseline Documentation* (DOE, 1994a). This standard was retired by DOE Sunset Review in October 2001 and has been replaced by DOE-STD-1120-98. In accordance with the new standard, "Sites that have previously implemented DOE-EM-STD-5502-94 facility designations may continue to use them for their intended purposes" (DOE, 1998).

Nuclear Safety Management, 10 CFR Part 830 (CFR, 2001), *Hazard Categorization and Accident Analysis Techniques*, DOE-STD-1027-92 (DOE, 1992), and DOE-STD-5502-94 (DOE 1994a) mandate that safety evaluations be performed for facilities that have the potential to adversely affect the health and safety of the workers and the public or the environment. The Site SAR meets these requirements and provides safety documentation for facilities classified as nuclear hazard Category 3, radiological, non-nuclear, and industrial. The Site SAR is separated into two volumes, the first contains information that is applicable to the site as a whole, and may be referenced by all authorization basis documents. Site-wide information contained in Volume I include

- descriptions of the site and site-wide utilities,
- authorization basis safety analysis methodology,
- information concerning site-wide hazards,

- summaries of the Site Safety Management Programs (SMPs),
- site-wide operational controls and analyses, including transportation, engineering, and outdoor waste management controls, and
- facility summaries and interactions

Volume II of the Site SAR is a compendium of individual facility safety analyses for facilities, systems, or operations identified to be radiological, non-nuclear low, or industrial. These individual analyses reference Volume I information, listed above, to eliminate duplication of information. This FSA comprises a section of Volume II.

This FSA provides specific information on the activities performed by the AWTP's two major systems, the PWTS and the AWTS, a general description of the two systems, their individual segments, their interfaces in support of Site operation and closure, and develops the potential consequences associated with hazardous material inventory information. The safety analysis uses a hazard identification checklist and description table to provide the framework for the analysis. Standard industrial hazards noted on the table are not analyzed in detail unless they initiate a release of hazardous materials or worsen the consequences of a hazardous material release. Onsite AWTP transportation accidents, including those involving spills and fires, are considered bounded and controlled by those scenarios analyzed in the *Site SAR, Chapter 8, Transportation Safety Analysis* (RFETS, 2001a) for waste materials with greater Material-At-Risk (MAR). Those scenarios are cross-referenced and briefly discussed in Section 4 for completeness, but are not analyzed further. Section 5 of this FSA details those controls necessary for the safe operation of the AWTP, including transportation and transfer activities.

Section 5 of this FSA provides the scope of approved AWTP activities and operational controls, including documenting the AWTP (PWTS and AWTS) Waste Acceptance Criteria (WAC).

2. FACILITY DESCRIPTION AND ACTIVITY CHARACTERIZATION

This section provides a brief description of the AWTP, its two major systems, the PWTS and the AWTS, each system's elements and segments, operation of the systems, and the systems' interfaces with other facilities, and their operations on the Site

The PWTS and AWTS, together, are integral parts of the Site Wastewater Treatment Strategy designed to allow early Site closure. A synopsis of the Site's Wastewater Treatment Strategy, including AWTS plans and system descriptions, are documented in the *Statement of Work for Offsite Aqueous Waste Treatment System* (K-H, 2001a), and the *Preliminary Hazard Categorization for the Aqueous Waste Treatment System* (K-H, 2001b)

Because of the relatively low level of hazards associated with the systems, they have no safety class systems depended upon to mitigate the consequences of a potential accident. The PWTS and AWTS systems and operational descriptions provided in this safety analysis are for information purposes only.

2.1 FACILITY MISSION

The previous mission of the PWTS involved transporting process waste from waste-generating facilities to Building 374 for treatment via both underground lines/vaults and onsite tanker trucks. To support Site closure and timely decommissioning of Buildings 371/374 and the PWTS itself, the PWTS' mission changed to allow such liquid waste transfer to the AWTS 231 Tanks for storage until the waste is transported offsite by the AWTS offsite transport tanker for treatment.

LL/LLM wastewater will be collected from the points of generation using a combination of tanker transfer stations and portions of the existing underground PWTS. The primary generation sources include, but are not limited to, Buildings 559, 371/374, 707/776/777, 771/774, 891, as well as incidental sources such as valve vault sumps and ground water. During Site closure, Site Project(s) D&D activity schedules may require individual facilities to transition from waste transfers via the PWTS lines to transfers using onsite tanker trucks.

The AWTS will utilize elements of the PWTS for onsite transfers of LL/LLM waste solutions to the 231 "A" and "B" Tanks for storage, the 231 "A" Tank will be used only for contingency storage. The AWTS uses a vendor-operated offsite tanker transport truck to convey this liquid LL/LLM waste to an offsite facility for treatment.

The AWTP and its two major systems, the PWTS and the AWTS, and their relationship to Site facilities and operations is depicted in Figure 1.

Waste streams permitted in the PWTS and AWTS consist of RCRA-regulated, non-hazardous low-level, and radioactive mixed aqueous wastes compliant with AWTP's WAC found in Section 5 of this FSA. The PWTS is currently identified as Resource Conservation and Recovery Act (RCRA) Unit 374.3, the PWTS and AWTS operate in accordance with the

permit conditions of the *Site Resource Recovery and Conservation Act Permit* (RFETS, 1997)

After the AWTS has been approved for operations and as part of the activities associated with general risk reduction and Site closure, portions of the PWTS will be brought to closure using either the RCRA closure process or removed as RCRA waste. The system will be systematically deactivated and closed in stages as the operations in interfacing Site facilities cease or are deactivated.

2.2 FACILITY DESCRIPTION

The existing major elements of the AWTP (PWTS and AWTS) are listed below and further described in the system configuration section.

PWTS:

- Underground lines
- 20 valve vaults (VV 1 thru VV 20)
- Building 231 pumphouse
- Building 428 pumphouse (PS-1)
- Tank D-853 (presently in a RCRA Stable condition) located in Building 428
- Tanker trucks (3,500 - 6,000 gallon capacity) for onsite transfers to the 231 Tanks
- Portable dumpster tanks
- Transfer stations

AWTS:

- Transfer stations for offsite transport truck
- 231"A" and 231"B" Tanks (Interim RCRA status pending closure, still designated as Units 43 01 and 43 02 respectively) (Note the "A" Tank is being emptied and cleaned and may be used by the AWTS for operational contingencies)
- Vendor-operated offsite tanker transport truck (5,000 – 6,000 gallon capacity)

2.2.1 Systems Configuration

Each facility or group of facilities onsite identified in Figure 1 possesses a tank or set of tanks for the accumulation of liquid LLM waste. The identified buildings are either individually or collectively connected to the system by way of the PWTS's valve vaults (VV). The lines between the various facilities' tank(s) and the respective first valve vault are equipped with one or more check-valves to prevent backflow. Each of these facility tanks or tank systems also has a pump or pumps, which provide the motive force for transfers of the waste from the tank(s) of origin via the PWTS VVs and lines to the AWTS 231 Tanks for storage.

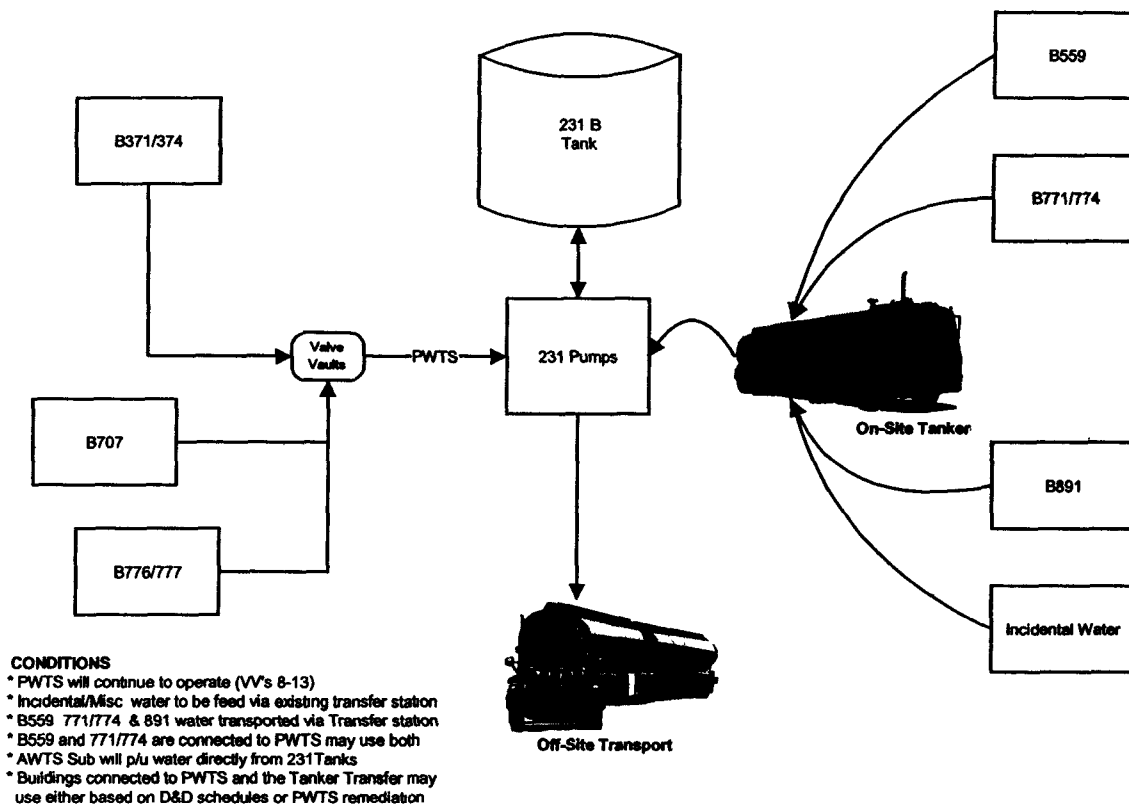


FIGURE 1. AQUEOUS WASTE TRANSFER PROJECT (PWTS & AWTS)

The valve vaults are underground concrete structures with above grade access, varying in depth to compensate for differences in associated piping depth. The purpose of the VV is to allow for various valve lineups, isolation of portions of the system for maintenance and the isolation of portions of the system that are no longer in use. The interiors of the vaults have four-foot high Gundel liners to provide containment of any fluid leaked into the vault(s). The liners are sufficiently spaced away from the outside wall of the vault to provide a space for potential accumulation of water leaching through the outside wall. Each of the valve vaults is protected by an above ground structure which provides protection from the weather to keep precipitation from entering the vault sumps. The protective structures, in varying states of repair, are either permanent metal buildings (6), temporary structures constructed of wood and reinforced plastic film sheeting (13), or Plexiglas and wood structures (1).

The PWTS onsite tanker trucks have a capacity of approximately 3,500 to 6,000 gallons and are used to transfer Site liquid LL/LLM wastewater from Site facilities to the 231 Tanks when PWTS valve vaults are not used. Waste transferred via the PWTS onsite tanker trucks will be compliant with the AWTP's WAC (see Section 5 of this FSA).

The system also includes the Building 231 pumping station. The station is comprised of the pumphouse itself and the two adjacent tanks, the AWTS 231 "A" and "B" Tanks. Building 231 houses pumps, piping, and valves that are used to transfer wastewater between the tanks and Valve Vault 12. The Building 231 pumphouse can also be used to pump (or assist to pump) liquids into and out of tanker trucks into Tanks 231 "A" and "B".

As part of the AWTS, the 231 "B" Tank will be the primary location for storage, the "A" tank is presently being emptied and cleaned and may be used by the AWTS, if required, for contingency storage. An existing transfer station is located at Building 231 to facilitate waste transfers to and from the 231 Tanks via PWTS onsite tanker trucks from sources throughout the Site. The PWTS onsite tanker trucks are operated in accordance with the requirements of the *Site Transportation Safety Manual* (RFETS, 2001) (see Section 4.3 of this FSA, Transportation Safety Evaluation).

Building 231 consists of a below-grade concrete structure and an above-grade pre-engineered metal structure. The operating floor is the lower portion of the building, while the aboveground portion serves primarily as an access way. A pad-mounted dry-type transformer outside the building supplies 480-V electrical power. A dry-type transformer inside the building provides 240/120-V power.

The 231 Tanks are used to store LL/LLM liquid utility wastes from facility sources, dumpster tanks, and onsite tanker trucks, as well as from D&D activities in nuclear facilities across the Site. Both the 231 "A" and "B" Tanks are vertical, cylindrical steel tanks located north of Sage Avenue near its intersection with Seventh Street. The capacities of the 231 "A" and "B" Tanks are 250,000 gallons and 950,000 gallons, respectively. The tanks are equipped with both mechanical and ultrasonic level detectors, which have remote readouts in the pumphouse.

Building 428 is designated as Pump Station No. 1 of the PWTS. The building houses the tank and pump transfer system to accumulate and transfer aqueous wastes. Tank D853 is out of service. Building 122's waste is transferred from a small tank to a dumpster tank for shipment via onsite tanker truck to the 231 Tanks for storage.

The AWTS offsite tanker transport truck is a vendor-operated tanker truck (capacity of approximately 5,000 to 6,000 gallons) used to transfer Site LL/LLM wastewater from the 231 Tanks to an offsite treatment facility. This tanker truck will be operated in accordance with State and Federal hazardous waste transportation requirements (see Section 4.3 of this FSA, Transportation Safety Evaluation). Offsite shipment of the waste, classified as a DOT non-radiological bulk Class 9 material (CFR, 2000a), will be via a reusable MC312 cargo tank.

2.2.2 Protective Features, Equipment and Leak Detection

The underground piping runs consist of double wall piping to maximize confinement and to provide a means for leak detection. The double wall piping is coupled to single wall piping within the inner space of the vault created by the vault liner. The location of this coupling is made such that leakage of the inner piping, in the between-vault piping runs, will drain into the annular space between the inner and outer piping. The leakage will then be

delivered by gravity to collection reservoirs located at the single-double wall transitions in one or both of the valve vaults adjacent to the leakage source. These reservoirs are equipped with level detection, which alarms on fluid accumulation in the reservoir.

Each vault contains a sump in the floor to collect leakage from the valves and piping contained within the vault. There are three alarms in each vault: one in the leak detection bottle, one in the liner sump and one between the liner and the concrete wall of the valve vault behind the liner. Ground water in-leakage is generally the source for water accumulating behind the liner. Any of the three level indicators listed will cause an annunciation local to the valve vault and in the Building 374 control room; alarm annunciation locations may change in the future with operation of the AWTS. Waste Operations responds to these alarms, identifies the source of in-leakage, isolates processes potentially causing leakage and returns the accumulated fluid to waste processing.

Each valve vault is equipped with Class ABC (Halon, dry chemical, or pressurized water) hand-operated fire extinguishers. All of the aboveground buildings are equipped with blowers to ventilate the vaults prior to entry. A portable generator powers the blowers. Confined space entry requirements are fulfilled before vault entry (including ventilation of the vaults).

Building 231, an unoccupied facility, is equipped with heating, safety shower/eye wash, fire detection (local annunciation), and telephone service. There is also a spill response cabinet on the outside of the building. Tanks 231 "A" & "B" are mounted within concrete secondary containment berms that are lined with Hypalon. Water collected in the berms is pumped into the tanks or to ground, dependent upon guidance from surface water personnel. The capacity of the berms is adequate to contain the entire contents of the tanks. The 231 "A" and "B" tanks are isolated via valve alignment to preclude unintended commingling of waste between the "A" and "B" Tanks.

The AWTS offsite tanker transport truck uses spill prevention mechanisms to prevent inadvertent release of aqueous waste during waste handling and transfer activities onsite. Necessary procedural precautions are taken to prevent freezing of equipment that could cause the release of hazardous materials to the environment during cold weather. Upon transfer of aqueous waste to the AWTS offsite transport tanker, the subcontractor must remove the tanker from the Site within eight hours (by contract); the tanker will not be stored at the Site. If, due to transportation equipment or transportation logistical issues, the vehicle cannot be removed from the Site within twelve (12) hours, one of the following actions will be taken:

- The contents of the transport tanker will be pumped back into the 231 "A" and/or "B" Tank for storage until the transport tanker can leave the Site, OR,
- notification to the Colorado Department of Public Health and Environment (CDPHE) is made that the twelve (12) hour limit will be exceeded and that RCRA-compliant temporary storage of the tanker is required.

2 2 3 Facility Systems and Utilities

Operation of the PWTS and AWTS requires several Site utilities: electric power, radio and telephone communications, fire detection (*i.e.*, PWTS VV/facility interfaces as described below), and domestic water for safety showers/eyewash in Building 231. Onsite and offsite transportation trucks interface with the Site Transportation and Traffic departments.

2 2 4 Facility Interfaces

PWTS and AWTS interface with several facilities on Site as depicted in Figure 1. The systems accept LL/LLM aqueous waste from Buildings 559, 371/374, 707/776/777, 771/774, and 891. They also accept such waste from other Site sources by using portable dumpster tanks (approximately 450 gallons) or PWTS onsite tanker trucks (approximately 3,500 – 6,000 gallons each). As the Site progresses with D&D and environmental remediation activities, collection of aqueous waste may transition from PWTS valve vault and piping transfers to dumpster tank collection and/or transfers via onsite tanker trucks. As Site facilities and infrastructure are removed, aqueous waste collection may require new, innovative methods to collect, sample, and ship the waste offsite for treatment and disposal. Such changes may require further analysis and revision of this FSA as described in Section 5.

2 2 5 Facility Inventory & Source Term Development

The PWTS transports and collects aqueous liquid wastes from process facilities and environmental sources for storage in the AWTS 231 Tanks. Wastes entered into the system must be below the Hazard Category 3 threshold of < 8.4 grams Pu equivalent and must have a minimum pH of 2.0 (see Section 5) for each identified PWTS and AWTS segment listed below:

- the PWTS underground valve vaults and lines segment,
- the PWTS onsite tanker trucks (~3,500 - 6,000-gallon each) segment (includes portable dumpster tanks),
- the AWTS 231 "A" and "B" Tank segment, and
- the AWTS offsite tanker truck (~5,000-6,000-gallon) segment

Individual nuclear facility source tank radionuclide activity is verified via sampling and analysis. These analyses and corresponding mass balance calculations are used as an inventory control to ensure compliance with the AWTP's WAC (see Section 5) prior to waste transfers. PWTS valve vaults, Building 231 (the process waste pumphouse), and transfer lines do not store wastes, but may contain residual liquid waste holdup that remains in lines after a waste transfer is completed. The PWTS onsite tanker trucks have a capacity of approximately 3,500 to 6,000 gallons and are used to transfer Site liquid LL/LLM wastewater from Site facilities to the 231 Tanks. Waste transferred via the PWTS onsite tanker trucks will be compliant with the AWTP's WAC.

The AWTS's 231 "B" Tank has a capacity of 950,000 gallons, the 231 "A" Tank has a capacity of 250,000 gallons. Site process wastewater is transferred to the 231 Tanks for storage via either the PWTS piping segment or PWTS onsite tanker trucks (3,500-6,000-

gallon capacity) only after verification that the transfer is compliant with the WAC described in Section 5 of this document

The AWTS offsite tanker transport truck has a capacity of approximately 5,000 to 6,000 gallons and is used to transfer Site liquid LL/LLM wastewater from the 231 Tanks to an offsite treatment facility. Waste transferred from the AWTS 231 Tanks to this offsite tanker truck will be compliant with the offsite treatment facility's WAC and applicable DOT regulations.

3. SAFETY MANAGEMENT PROGRAMS

The authorization basis for the AWTP relies on adequate Site-level implementation of Site Safety Management Programs (SMPs) as defined in the Rocky Flats Environmental Technology Site Safety Analysis Report (Site SAR), Chapter 6 (RFETS, 2001a). SMPs provide Site-level implementation of specific safety attributes assumed in the safety analysis that are either specifically credited or recognized to be important for providing defense-in-depth. All of the identified SMPs and their programmatic elements are implemented at a Site level.

Building-specific implementation of some SMPs is required based upon the specific hazards identified in Section 4, Hazards Analyses. These SMPs are implemented using a graded approach that is focused on those specific attributes of the SMPs associated with identified hazards, hazard assumptions, and initial conditions presented in the safety analysis.

3.1 SMP RELATIONSHIP TO HAZARDS ANALYSIS

The following sections delineate the relationship between the various Site-level SMPs and the PWTS's and AWTS's current missions, operations, and related hazards.

3.1.1 Facility Participation In Site-Level Implementation of SMPs

Based on the current facility mission and those hazards identified for the facility mission, the facility participates in the following SMPs at a Site level:

- Conduct of Operations
- Configuration Management
- Document Management
- Emergency Preparedness
- Engineering
- Environmental Management
- Fire Protection
- Integrated Work Control
- Occupational Safety and Industrial Hygiene
- Quality Assurance
- Radiological Protection
- Testing, Surveillance, and Maintenance
- Training
- Transportation Safety

3 1 2 SMPs Important to Hazards Analysis

This section describes the SMPs that are applicable to the safe operation of the AWTP based on the PWTS's and AWTS's life cycles. The following SMPs provide the basis for maintaining the safety envelope of the systems' facilities.

- **Waste Management**

Attributes of the PWTS and AWTS Waste Management Program focus on (a) ensuring waste generation, sampling and analysis/characterization, transfers or transportation, storage, and disposal are performed in accordance with State and Federal regulations, (b) controlling configuration, location, and quantities of hazardous, radioactive, and mixed waste, (c) maintaining a current, documented waste inventory, and (d) performing routine surveillance, inspections, and monitoring of compliance with regulations. The facility performs inventory controls such as sampling and analysis to confirm compliance with the AWTP's WAC found in Section 5 of this FSA.

- **Nuclear Safety**

Administrative controls are placed on the PWTS and AWTS hazardous material inventories to prevent the introduction of materials into the facility that would invalidate the safety analysis basis of the facility, including their *radiological* hazard categorizations. Important attributes of the Nuclear Safety Program for the PWTS/AWTS focus on inventory controls such as sampling and analysis and material control balance that limits the quantities of radionuclides to less than 84 grams Pu equivalent in each PWTS and AWTS segment. This limitation is in accordance with the AWTP's WAC controls specified in Section 5 of this document.

- **Criticality Safety**

Administrative controls are placed on the PWTS and AWTS to ensure that the likelihood of criticality is less than 10^{-6} per year. These controls are implemented as part of the Building 374 Liquid Waste Operations Criticality Safety Program (RFETS 2001b). This program covers the PWTS underground vaults and lines segment, the PWTS onsite tanker truck segment, and the AWTS 231 Tanks segment as presented in Section 2.2.5. The vendor-operated AWTS offsite tanker transport truck segment is not covered under this program implementation but is subject to the controls specified in Section 5 of this FSA.

4. HAZARDS ANALYSIS

The activity and facility descriptions in this FSA provide the basis for the identification and evaluation of hazards associated with the AWTP systems. The FSA's interfaces with other analyses pertinent to the operation of the AWTP are discussed. Routine occupational hazards are regulated by DOE-prescribed occupational safety and health standards and are not evaluated further unless they initiate a release of hazardous materials or worsen the consequences of a hazardous material release. This section determines the final hazard classification from which the operational controls found in Section 5 are derived.

4.1 METHODOLOGY AND ASSUMPTIONS

The methodology contained in the *Safety Analysis and Risk Assessment Handbook* (SARAH), (RFETS, 2001c) is followed in this hazard analysis. Characteristics of the system and waste streams described in Section 2 are used for this analysis.

4.2 HAZARD IDENTIFICATION

All hazards listed in Table 1 were evaluated to specifically identify those hazards associated with the PWTS and AWTS operation, including future hazard reduction activities in advance of remediation and D&D. The hazards present are indicated with a "Yes" and are described in greater detail in Table 2, which provides information on quantity, form, packaging, and location of the hazards. As indicated in the remarks column of Table 2, most of the hazards are considered standard industrial hazards.

4.2.1 AWTP FSA Relationship to Other Facility Analyses

The *Fire Hazards Analysis for the Building 371/374 Complex* (RFETS, 1999a) was reviewed during preparation of Tables 1 and 2. As the FHA does not address PWTS or AWTS elements or equipment, conclusions from the FHA are not applicable to the AWTP FSA. Due to the size, replacement cost, historical operation, and life cycle of the AWTP facilities, and the nature of those facilities' fire hazards, a stand-alone FHA will not be developed separately for the AWTP. Flammability hazards associated with the AWTP are, however, adequately addressed in Table 2, Item 8 "Flammable Liquids, Gases, and Dusts", below.

Additionally, conclusions found in both the *Emergency Preparedness Hazards Assessment for 374 Facility* (RFETS, 2001d) and the *Transportation Emergency Preparedness Hazards Assessment* (EPHA) (RFETS, 2002) were reviewed for consonance with this FSA. The Building 374 EPHA generally describes the Process Waste Collection and Transfer System (PWCTS, also known as the PWTS) as a means to transfer waste to Building 374 for treatment. The EPHA analyzes conditions and materials specific to Building 374 itself, however, and not the PWTS. Therefore, conclusions from this EPHA are not applicable to this AWTP FSA.

The *Transportation EPHA* evaluates postulated onsite and offsite transportation event releases of liquid LL/LLM wastes. Postulated event conclusions using containerized waste

containers are in consonance with the bounding accident scenarios and scenario assumptions previously referenced in the *Site SAR*, Chapter 8, *Transportation Safety Analysis* (RFETS, 2001a)

Onsite AWTP transportation accidents, including those involving spills and fires, are considered bounded and controlled by those scenarios analyzed in the *Site SAR*, Chapter 8, *Transportation Safety Analysis* (RFETS, 2001a) for waste materials with greater Material-At-Risk (MAR). Those scenarios are cross-referenced and briefly discussed in Section 4.3 for completeness, but are not analyzed further. Section 5 of this FSA details those controls necessary for the safe operation of the AWTP, including transportation and transfer activities.

Table 1. PWTS and AWTS Hazard Identification Checklist

Hazard	Yes/No	Hazard	Yes/No
1 High Voltage	Yes	14 High Intensity Magnetic Fields	No
2 Explosive Substances	No	15 Effects of Chemical Exposures	Yes
3 Cryogenic Systems	No	16 Toxic, Hazardous, or Noxious Material	Yes
4 Inert & Low-Oxygen Atmospheres	Yes	17 Inadequate Ventilation	Yes
5 Direct Radiation Sources	No	18 Material Handling	Yes
6 Radioactive Materials	Yes	19 Ambient Temperature Extremes	Yes
7 High Noise Levels	No	20 Working at Heights	Yes
8 Flammable Gases, Liquids, Dusts	Yes	21 Pesticide Use	No
9 Compressed Gases	No	22 Lasers	No
10 High Temperature & Pressure System	Yes	23 Inadequate Illumination	Yes
11 Kinetic Energy	Yes	24 Biohazard	Yes
12 Potential Energy	Yes	25 Unknown or Unmarked Materials	Yes
13 Non-Ionizing Radiation Sources	No	26 Any Other Hazards	Yes

Table 2. PWTS and AWTS Hazard Descriptions			
Hazard/ Energy Source	Description	Preventive & Mitigative Features	Remarks
1 HIGH VOLTAGE			
13 8-kV power distribution lines and 115-kV transmission lines	Power lines, exposed and underground throughout site	<ul style="list-style-type: none"> - Lines are constructed per ANSI C2 - Overhead lines isolated by height - Underground lines isolated by burial - Procedures, training, protective equipment for maintenance fuses and breakers, switch out capability 	Standard industrial hazard
4. INERT AND LOW OXYGEN ATMOSPHERES			
No oxygen or low oxygen levels	Valve vaults, 231 "A" and "B" Tanks, and dumpster tanks may contain low oxygen levels	<ul style="list-style-type: none"> - Confined space entry program - Accesses sealed - Tanks not normally entered. - Atmospheres monitored prior to entry 	Standard industrial hazard See Item 17 below
6 RADIOACTIVE MATERIALS			
Process aqueous waste	950,000 gallons of aqueous process waste stored in the 231 "B" Tank and 250,000 gallons of aqueous waste in the "A" Tank., above-ground, double wall lines, valve vault lines, pumps, and associated lines and vessels, onsite and offsite tanker trucks, dumpster tanks	<ul style="list-style-type: none"> - Confinement - Testing - Radiation Protection Program - Spill Prevention Control and Countermeasure (SPCC) Program - PPE and training required for operators - Operational requirements for solution pH - HAZCOM Program 	Potential to exceed 40 CFR 302 reportable quantities (RQs) (CFR, 1997a) for radionuclides
8 FLAMMABLE GASES, LIQUIDS AND DUSTS			
Flammables in storage cabinet	Flammable storage cabinet outside Building 231 available for use but currently empty	<ul style="list-style-type: none"> - Small quantities - NFPA-approved containers/cabinet. - HAZCOM Program - Fire extinguisher 	Standard industrial hazards
Onsite and offsite tanker trucks fuel	Up to 275 gallons in onsite or offsite tanker truck fuel tanks	<ul style="list-style-type: none"> DOT-compliant vehicle tanks - Vehicle inspections per Site Transportation Safety Manual - Vehicle fire extinguishers 	Onsite and offsite truck accident scenarios are analyzed in <i>Site SAR</i> , Chapter 8
10 HIGH TEMPERATURE AND PRESSURE SYSTEM			
Process pumps	Process pumps generate pressure to transfer liquids throughout the PWTS/tanker trucks Malfunctioning pumps or closed valves allow conversion of the mechanical energy to thermal energy	<ul style="list-style-type: none"> - Limited worker access - Training - Double containment of lines - HAZCOM Program 	Standard industrial hazard See Item 12 below

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Table 2. PWTS and AWTS Hazard Descriptions			
Hazard/ Energy Source	Description	Preventive & Mitigative Features	Remarks
11 KINETIC ENERGY			
Vehicular traffic	Movement of forklift, PIT equipment and onsite and offsite tanker truck vehicles	<ul style="list-style-type: none"> - Licensing, - Regulation, - Enforcement, - Training, - Markings, - Signage 	Standard industrial hazard
Pumps	Several pumps of various types	<ul style="list-style-type: none"> - Low pressure capabilities only 	Standard industrial hazard
12 POTENTIAL ENERGY			
Pump head pressure in liquid lines	Liquid contained in double wall lines, valve vaults, and associated lines and vessels	<ul style="list-style-type: none"> - Low pressure system - Limited worker access - Double containment - Underground lines - Below grade components 	Standard industrial hazard. See Item 10 above
Fluid density pressure in Storage Tanks	Liquid with density near 1 g/cc, varies with height of fluid in tank	<ul style="list-style-type: none"> - Workers not generally in basin (bermed area) for large tanks (231A and B Tanks) - Relatively low specific activity of liquid - Chemical acceptance criteria (i.e., pH) for liquids to enter the system 	Standard industrial hazard See Item 10 above
15 CHEMICAL EXPOSURES			
General industrial chemicals	Fuel, maintenance products stored in cans, primarily manufacturers' packaging, outside Building 231	<ul style="list-style-type: none"> - Procedures - Chemical tracking - Warning labels - Ventilation - Packaging - HAZCOM Program - SPCC Program 	Standard industrial hazard
16 TOXIC, HAZARDOUS, OR NOXIOUS MATERIALS			
Process waste	950,000 gallons of aqueous process waste stored in steel shell "B" tank (250,000 gallons of aqueous waste in the "A" Tank undergoing emptying and cleaning) with concrete, Hypalon lined, secondary containment berm, process waste transferred via PWTS segment itself; tanker trucks, dumpster tanks	<ul style="list-style-type: none"> - Double containment/container - PPE and training for operators - HAZWOPER, HAZCOM Program, and operations training - Chemical Waste Acceptance criteria (i.e., pH) for liquids to enter the system - Locked access - Administrative control 	Potential to exceed 40 CFR 302 RQs but remain below 29 CFR 1910 119 (CFR, 1994) or 40 CFR 355 (CFR, 1997b) thresholds for some metals
Valve Vaults			Constituents are anticipated to be below 29 CFR 1910 119 (CFR, 1994) or 40 CFR 355 (CFR, 1997b) thresholds due to limited groundwater source

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Table 2. PWTS and AWTS Hazard Descriptions			
Hazard/ Energy Source	Description	Preventive & Mitigative Features	Remarks
17 INADEQUATE VENTILATION			
Process wastewater tanks	Two steel tanks at ground level, two at Bldg 231, one underground tank in Bldg 428, dumpster tanks	<ul style="list-style-type: none"> - Confined space entry program - Accesses sealed - Tanks not normally entered. 	Standard industrial hazard
Valve vaults	20 below-grade concrete, including outdoor, vaults with access hatches located throughout site	<ul style="list-style-type: none"> - Confined Space Entry Program - Forced ventilation and testing prior to entry - Workers dressed as appropriate for the weather 	Standard industrial hazard
18 MATERIAL HANDLING			
	Lifting of waste transfer dumpster tanks from onsite tanker trucks via fork lifts, PITs, etc during waste transfers	<ul style="list-style-type: none"> - Training - PITs designed/constructed to ASME 56 1 Fuel-powered PITs comply with NFPA 505, and either UL 558 or NFPA 52 	Standard industrial hazard
20 WORKING AT HEIGHTS			
Tanks	Access to top of tanks and tanker trucks	<ul style="list-style-type: none"> - Protective railings - OSHA compliance - Training - PPE/Fall Protection Equipment 	Standard industrial hazard
23 INADEQUATE ILLUMINATION			
Valve vaults	20 below-grade concrete vaults with access hatches, located throughout site	<ul style="list-style-type: none"> - Training - Portable illumination when accessed 	Standard industrial hazard
24 BIOHAZARD			
Valve vaults	Sewage overflows in valve vaults with potential bacteriological or viral effects	<ul style="list-style-type: none"> - Training - PPE - HAZCOM Program - Infectious Agent Exposure Control Program 	Standard industrial hazard
25 UNKNOWN OR UNMARKED MATERIALS			
Process waste could contain arsenic, beryllium, chromium, lead, silver, selenium, toluene, cadmium, nickel, acetone, 1,1,1-trichloroethane, methylene chloride, barium, ethylene glycol, penetrating oil, carbon tetrachloride, denatured alcohol, isopropanol, Mariko, Oakite, spent emulsifier, spent developer, and diamond paste (No longer applicable to D-853 in Bldg 428 due to its RCRA Stable condition)	Potential for groundwater with unknown contaminants (No longer applicable to D-853 in Bldg 428 due to its RCRA Stable condition)	<ul style="list-style-type: none"> - HAZWOPER, HAZCOM, and operations training - Double containment. - Locked access - PPE - Administrative controls - Chemical Waste Acceptance criteria (i.e., pH) for liquids to enter the system pH for this system is 2 or greater (No longer applicable to D-853 in Bldg 428 due to its RCRA Stable condition) 	Based on process knowledge, this output should not be hazardous Such unknown hazards will be addressed via IWCP process, JHAs, HASP (No longer applicable to D-853 in Bldg 428 due to its RCRA Stable condition)
26 OTHER HAZARDS			
Various PWTS and AWTS locations	Heavy lifting of hoses, spill containment packages, etc during Site waste transfer activities	<ul style="list-style-type: none"> - Training - Manlifts of equipment greater than 50 lbs require mechanical lift devices 	Standard industrial hazard

4.3 TRANSPORTATION SAFETY EVALUATION

PWTS onsite truck transfers and AWTS offsite shipments of process liquid LL/LLM waste conform to the requirements of the *Site Transportation Safety Manual* (RFETS, 2001). Onsite and offsite transportation of process liquid LL/LLM waste is performed in accordance with 10 CFR Part 71, *Packaging and Transportation of Radioactive Material* (CFR, 2000a) and 49 CFR, *Transportation* (CFR, 2000b). Offsite shipments of AWTS waste, including contractor and subcontractor activities, also conform to the requirements of 49 CFR (CFR, 2000b), Title 6, *Hazardous Waste*, and Title 8, *Rules and Regulations Concerning Minimum Standards for the Operation of Commercial Vehicles*, of the Colorado Code of Regulations (CCR, 1990 and CCR, 1996, respectively). CFR, 2000b, CCR, 1990 and CCR, 1996 specify requirements for operator training and permits, safety inspections, route selection, vehicle specifications, and incident/accident reporting. Protection to the public is provided by conformance to the above regulations regarding the types, quantities, and packaging of hazardous and radioactive materials transported on public roads. The AWTP participates in the *Site SAR Transportation Safety SMP* (RFETS, 2001a) at the Site level.

The *Site SAR* (RFETS, 2001a) and the *Safety and Risk Assessment Handbook* (SARAH) (RFETS, 2001c) contain the identified transportation hazards, assumptions, and controls for onsite and offsite transfers of radioactive and hazardous materials. Onsite and offsite tanker vehicle types, capacities, and waste packaging are bounded by the *Site SAR* transportation accident scenario assumptions and conclusions. The PWTS assumes an average frequency of approximately one hundred (100) onsite transfers per year of process liquid LL/LLM wastes from generating facilities to the 231 Tanks for storage (see Figure 1). The AWTS also assumes an average frequency of approximately sixty (60) offsite shipments per year of this waste from the 231 Tanks to an approved offsite treatment facility.

AWTP onsite and offsite tanker truck transport frequencies and accident scenarios, including those involving vehicle fires and spills, are addressed and considered bounded by the *Site SAR*, Chapter 8, *Transportation Safety Analysis* (RFETS, 2001a), including traffic accident, transfer, container integrity, and fire and spill scenario assumptions. Those *Site SAR* major (Accident Severity Category IV-VIII) fire and spill accident scenarios involving radioactive waste appropriate for AWTP Material At Risk (MAR) values fall into the *extremely unlikely* (10^{-4} to 10^{-6}) and *incredible* ($\leq 10^{-6}$) frequency bins. Such postulated fire and spill accident scenarios result in *low* consequences to the Maximum Offsite Individual (MOI) and *moderate* consequences to the Collocated Worker. No further AWTP transportation safety analysis is required. Controls commensurate with the above scenarios are presented in Section 5 of this FSA.

4.4 WORKER SAFETY EVALUATION

Many of the worker safety hazards presented by the PWTS and AWTS are standard industrial hazards. Hazards in this category include high voltage, general industrial chemicals, process chemical exposure, and inadequate ventilation. Worker training, use of controls established in the approved *Building 374 Health and Safety Plan* (RFETS, 1994), the *Valve Vault, Tanker, and Dumpster Tank Operations Operational Safety Analysis* (OSA) (RFETS, 1999b), PWTS and AWTS procedures, the *Site Occupational Safety and Industrial*

Hygiene Manual (RFETS, 1999c), and implementation of Site SMPs (RFETS, 2001a) assure appropriate levels of worker protection for these hazards

Nuclear hazards associated with the PWTS and AWTS are limited in that high radiation fields are not present, and specific activities are relatively low. Workers are trained to handle these materials in accordance with approved procedures. Radiological protection for workers is further assured by AWTP compliance with *Site SAR, Chapter 6, "Safety Management Programs"* (SMPs) (RFETS, 2001a)

4.5 FINAL HAZARD CLASSIFICATION

The final hazard classification is determined from the bounding quantities of radionuclides and chemicals that may reside in the AWTP systems, the PWTS and AWTS

The AWTP, including the PWTS and AWTS, is categorized as a *radiological* facility based on the amount of Pu and other radionuclides to be transferred, stored, and/or transported offsite in its systems and their respective segments listed below

- the PWTS underground valve vaults and lines segment,
- the PWTS onsite tanker truck (3,500 - 6,000 gallons each) segment (includes portable dumpster tanks),
- the AWTS 231 "A" and "B" Tank (250,000 and 950,000-gallons, respectively) segment, and
- the AWTS offsite tanker truck (5,000 - 6,000-gallons) segment

The AWTP includes a conservatively high average onsite operational treatment throughput of 500,000 gallons per year with a potential treatment expansion capability of approximately 1,500,000 gallons per year, if necessary. For conservative Material at Risk (MAR) planning, the MAR for the PWTS and AWTS, on a year-to-year basis, is assumed using the Table 3 MAR estimate for Fiscal Year (FY) 2003 of 2,100,700 gallons of influent. This influent is transferred via the PWTS to the AWTS 231 Tanks for storage awaiting transport offsite for treatment via the AWTS (K-H, 2001a and b)

The PWTS and AWTS are distributed across the Site, and as such, are segmented as allowed by DOE-STD-1027-92, Attachment 1, General Ground Rules (DOE, 1992). The lack of physical interaction between the independent WAC-compliant PWTS and AWTS elements or segments precludes bringing radiological materials together or causing harmful interaction from common severe phenomenon. The maximum amount of plutonium (Pu) in any given PWTS and AWTS segment is estimated at 4.7 grams Pu (see Table 3 below, and see *Preliminary Hazard Categorization for the Aqueous Waste Treatment System* and that document's approval by DOE, respectively (K-H, 2001b and DOE, 2001). This MAR is less than the hazard Category 3 threshold value of 8.4 grams Pu listed in DOE-STD-1027-92. The final hazard classification for the elements and components of the AWTP (PWTS and AWTS) is summarized in Table 4 and Section 4.4.3. Chemical hazards are bounded by the radiological hazards involved with the MAR associated with the PWTS and AWTS. Such hazards are identified and addressed in Tables 1 and 2 of this document.

PWTS and AWTS Pu MAR estimates (K-H, 2001a and b) are delineated by Building Utility (i.e., footing drains, condensate, and water walls) and High D&D value (LL/LLM wastes generated during facility D&D) waste streams in Table 3 below. The expected Pu average concentration for all influent LL/LLM wastewater is 2E-06. The maximum Pu concentration is 1.7E-03. Wastes from the Caustic Waste Treatment System (CWTS) in Building 371 can be as high as 5E-03 g/L Pu. There are, on average, less than 1,000 gallons/yr of aqueous waste with Pu concentrations above 1E-05 gm/L, and 300 gal/yr above 100 nCi/g (6E-04 gm/l). All average Pu concentrations shown are weighted averages. Activity calculations are based on 32-yr old Pu mixtures that are equivalent to 0.1614 Ci/gm. Higher level activity wastes may require blending in the 231 Tanks, however, controls delineated in this Safety Analysis, Section 5, ensure that no PWTS and AWTS segment will exceed 8.4 g Pu equivalent MAR at any time.

TABLE 3 PWTS AND AWTS MAR ESTIMATES BY FISCAL YEAR

Waste Stream	FY 02 (gr Pu)	FY 03 (gr Pu)	FY 04 (gr Pu)	FY 05 (gr Pu)	Volume Basis
Utility	1.3	0.9	0.7	0.2	Building Estimates (1)
High D&D	1.0	3.9	1.6	-	Sq Ft Estimates (2)
Total Grams Pu/Yr	2.3	4.8	2.3	0.2	
Total Gallons To Be Treated (3)	645,600	2,100,700	886,232	25,500	Highest Reasonable Volume Estimates
Note (1) See Building 374 Logbooks (4-year weighted average) Note (2) Estimate based on Building 779 D & D average Pu concentration X 10 Note (3) Volumes are for the onsite treatment option. Existing interim storage/treatment capacity is currently insufficient, however, additional shifts can be added if required to allow entire waste volume treatment					

4.5.1 MAR Assumptions

Major assumptions used to estimate the Table 3 MAR include:

- Metals data are based on current samples from the 231 Tanks
- The 231 "A" and "B" Tanks are being emptied and cleaned,
- D&D High aqueous waste volumes are based on reasonably conservative square footage estimates (Building 779 historical measurements)
 - > 50% of floor square footage requires Hydrolasing for Nuclear Facilities
 - > 10% of walls requires Hydrolasing excluding Buildings 776/777 and 707
 - > 100% of walls require Hydrolasing for Buildings 776/777 and 707
 - > Ceiling square footage is 2X floor square footage
 - > 2 gallons/square foot for floor and walls, 1 gallons/square foot for ceiling
- Process waste stream influent for the PWTS and AWTS systems assumes 1% solids and 10 ppm of organics. Note: These solids and organic constituents have not historically been seen by Building 374. The radiological inventory bounds the waste stream chemical

constituent and process chemical inventory (see Table 2, Items 15, 16, 25 for standard industrial hazards descriptions)

- Influent does not include Modular Storage Tank wastewater or sludges
- Influent includes brines from Building 891
- Influent does not include waste waters associated with the storage of Solar Pond Sludge on the 750 Pad
- Waste from the Caustic Waste Treatment System (CWTS) will be metered into the PWTS and, therefore, the AWTS 231 Tanks for blending to maintain the facilities' *radiological* hazard categorizations

4 5 2 Hazardous Chemical Contaminants

Process waste may contain numerous chemicals with relatively low RQs of 1 to 100 pounds, particularly heavy metals (CFR, 1994, 1995, 1997a and b) It is conceivable that the RQs of one or more hazardous constituents could be exceeded in the 1,200,000 combined gallons stored in the AWTS 231 "A" (250,000 gallons) and "B" (950,000 gallons) Tanks Chemical hazards, however, are standard industrial hazards and bounded by the radiological hazards and are not analyzed further herein Waste streams are sampled for organic constituents as well as radiological constituents in compliance with the controls specified in Section 5 of this FSA LL/LLM wastewater transferred to the 231 Tanks for storage must comply with AWTP's WAC (see Section 5), including a minimum pH of 2.0 Chemical hazards are addressed in Table 2

4 5 3 Final Hazard Classification Conclusion

Based on guidance provided in DOE-STD-5502-94 (DOE, 1994a), the final hazard classification for the AWTP and its two major systems, the PWTS and the AWTS, including those systems' associated segments (see Table 4), is *radiological*. The PWTS and AWTS are distributed across the Site, and as such, are segmented as allowed by DOE-STD-1027-92, Attachment 1, General Ground Rules (DOE, 1992) The lack of physical interaction between the independent PWTS and AWTS elements or segments (*e.g.*, holdup in the piping/vaults, storage in the 231 "A" and "B" Tank, and transfers via onsite and offsite tanker trucks) precludes the unplanned mixing of radiological materials together or causing harmful interaction from common severe phenomenon While the onsite and offsite tanker trucks physically interact with the 231 Tanks and the PWTS, sampling and analysis prior to all waste transfers precludes exceeding the *radiological* limits for the PWTS or AWTS systems The MAR associated with the onsite and offsite tanker trucks is far less than the 200 gram Pu analyzed in the *Site SAR, Chapter 8 "Transportation Safety Analysis"* (RFETS, 2001a)

A *radiological* classification requires compliance with applicable OSHA Standards, and preparation of an auditable safety analysis This FSA serves as the auditable safety analysis for the AWTP and its major systems, the PWTS and the AWTS

TABLE 4. PWTS AND AWTS HAZARDS AND HAZARD CATEGORIES

Facility No.	Description	Chemical/Radiological Hazard	Hazard Category	Comments
		<i>PWTS Segments (2)</i>		
1-20	Valve Vaults	Provides connection path and leak detection for underground aqueous process waste lines (AWTP WAC –compliant [Maximum MAR is < 8.4 g Pu equivalent, minimum pH is not less than 2.0])	<i>Radiological</i>	
	Double Wall Underground Lines	Contains and transfers aqueous process wastes from generator facilities to 231 tanks (AWTP WAC – compliant)	<i>Radiological</i>	
	Onsite Tanker Trucks	Each tanker contains approximately 3500-6000 gallons (AWTP WAC – compliant)	<i>Radiological</i>	
		Portable 450-gallon Dumpster Tanks	<i>Radiological</i>	
		<i>AWTS Segments (2)</i>		
231	Process Waste Pumphouse	Pumps and transfers aqueous waste in Process waste system (AWTP WAC – compliant)	<i>Radiological</i>	Residual radiological constituents. The tank may be used by the AWTS for contingency storage Aqueous waste storage 950,000 gallons capacity Radiological bounds chemical
231A	Process Waste Storage Tank	Process waste - 250,000 gallons (AWTP WAC – compliant)	<i>Radiological</i>	
231B	Process Waste Storage Tank	Process waste - 950,000 gallons (AWTP WAC – compliant)	<i>Radiological</i>	
	Offsite Tanker Transport Truck	Each tanker contains approximately 5,000 – 6,000 gallons (AWTP WAC – compliant)	<i>Radiological</i>	

5 SCOPE OF APPROVED ACTIVITIES AND OPERATIONAL CONTROLS

Operational controls for the AWTP (e.g., PWTS and AWTS) are defined in applicable Safety Management Programs (SMPs) (Section 3) and administrative controls set forth in the PWTS and AWTS material transfer procedures. Such controls include inventory control, sampling and analysis, and material balance.

Approved activities and commensurate controls protective of the AWTP (PWTS and AWTS) safety envelopes and their respective *radiological* facility hazard categorizations are summarized below.

- PWTS hazard reduction activities supporting pursuit of RCRA Stable/Closure are authorized. Safety analyses for activities involving PWTS remediation and PWTS D&D may be documented in a future *Health and Safety Plan* (HASP).
- PWTS onsite tanker truck and AWTS offsite tanker truck transfers and transportation of process liquid LL/LLM wastewater shall comply with the controls, restrictions, required actions, and completion times identified in the *Site Safety Analysis Report*, Volume I (RFETS, 2001a).
- Onsite collection and transfer of process liquid LL/LLM wastewater to the 231 "A" and "B" Tanks for blending and storage using either onsite tanker trucks or the PWTS, is authorized. Wastewater collection and transfer location includes Site facilities and incidental sources such as manholes and groundwater from PWTS valve vaults, are authorized.

AWTP WAC

- Wastewater collected across the Site and stored in the 231 "A" and "B" Tanks shall be compliant with the AWTP's WAC established herein as a maximum total MAR of less than 8.4 grams Pu equivalent, and must have a minimum pH of 2.0.
- Staging of the AWTS offsite transport tanker at the 231 "B" Tank for transfer of wastewater to that tanker, is authorized.
 - Transfer of process liquid LL/LLM wastewater from the 231 Tanks to the AWTS offsite transport tanker, is authorized.
 - LL/LLM wastewater loaded into the AWTS subcontractor's offsite transport tanker for offsite treatment/disposal shall be compliant with that offsite treatment facility's WAC.
- Onsite transport of the loaded AWTS offsite transport tanker is authorized. If, due to transportation equipment or transportation logistical issues, the vehicle cannot be removed from the Site within twelve (12) hours, one of the following actions will be taken:
 - The contents of the transport tanker will be pumped back into the 231 "A" and/or "B" Tank for storage until the transport tanker can leave the Site, **OR**,

- notification to the Colorado Department of Public Health and Environment (CDPHE) is made that the twelve (12) hour limit will be exceeded and that RCRA-compliant temporary storage of the tanker is required
- Field measurements, inventory control, sampling and analysis, mass balance surveillance procedures, and logs are authorized methods to verify radiological material holdup and continued operation of the PWTS segment, the AWTS 231 "A" and "B" Tanks storage segment, the onsite transfer tanker segment, and the offsite tanker transport segment, as a *radiological facility*
- Storage, transfer, and staging for offsite shipment of LL/LLM wastewater in any PWTS or AWTS segment (see Section 2.2.5 for segment identification) in excess of 8.4 grams total Pu equivalent ($\text{Pu} + \text{U235} + [35 \times \text{Am}]$) MAR is prohibited. If, at any time, it is discovered that the *radiological facility* MAR limit for any PWTS and AWTS segment is exceeded (i.e., Category 3 threshold), the AWTP will cease receipt of additional waste into its systems. The AWTP will have 30 days to assess and correct system problems and reduce system/segment MAR to acceptable limits
 - The first three segments of the PWTS and AWTS as defined in Section 2.2.5 are covered under the Building 374 Liquid Waste Operations Criticality Safety Program
 - Should the vendor-operated offsite tanker transport truck segment of the AWTS exceed 1% of the minimum critical mass, the AWTP shall invoke a project Criticality Safety Program in accordance with the *Criticality Safety Program Manual* (RFETS, 2000) and the *Site SAR* (RFETS, 2001a). However, with implementation of the program there are no controls applied if the material is less than or equal to 15.0 grams of fissile material in a 55-gallon or larger volume in accordance with the *Criticality Safety Program Manual* (RFETS, 2000)

Any unforeseen and/or uncharacterized hazards shall be managed in accordance with applicable Site operations, documentation, and analysis requirements. Additionally, a revised or new analysis is required if facility operational controls are not sufficient to adequately address such unanticipated hazards or conditions encountered. The Responsible Manager shall immediately stop work and contact cognizant Nuclear Safety personnel to evaluate the discovered condition. A revised or new analysis will be required if project operational controls are deemed insufficient to adequately address the unanticipated hazards or conditions encountered, or if new or additional equipment which could potentially change the safety basis for the facility's operation is deemed necessary. To ensure work is safely and compliantly completed, the Responsible Manager (RM) must recognize these unanalyzed situations and request the necessary evaluation and revision to this auditable safety analysis before proceeding with such work.

6 REFERENCES

- CCR, 1990 *Hazardous Waste/Solid Waste, Standards Applicable to Transporters of Hazardous Waste*, Colorado Code of Regulations, 6 CCR, Part 263, Denver, Colorado, 1990
- CCR, 1996 *Rules and Regulations Concerning the Transportation of Hazardous Materials in the State of Colorado*, Colorado Code of Regulations, 8 CCR, Part 1507, Denver, Colorado, 1996
- CFR, 1994 *List of Highly Hazardous Chemicals, Toxics, and Reactives*, 29 CFR 1910 119, Appendix A, Subpart H, Office of the Federal Register, Washington, D C, 1994
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